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ORIGINAL ARTICLE

Smoking and Alcohol Drinking Related to Experience of Harmful Shops among Korean Adolescents

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Abstract
Objectives: This study was conducted in order to determine any correlation between experience of harmful shops and adolescent smoking and alcohol drinking in middle and high school students.
Methods: The survey was conducted using a self-administered questionnaire online via the homepage of the Ministry of Education student Health Information Center; 1888 and 1563 questionnaires were used for middle and high school students, respectively, for a total of 3451 questionnaires in the final analysis. The collected data were processed using SPSS version 21.0 and examined using frequency analysis and hierarchical linear regression.
Results: In this research, 8.3% of all participants were found to have experienced smoking and 17.0% alcohol drinking. Regarding the types of harmful shops, 81.8% said they had been to a gaming place; 21.2% to a lodging place; 16.0% to a sex and entertainment place; and 6.8% to a harmful sex industry location. Sociodemographic variables had a significant effect on adolescent smoking and alcohol drinking. Regarding environmental variables, a significant difference was observed for living with parents and school location. Among adolescent experience of harmful shops, both smoking and alcohol drinking showed a significant association with harmful sex industry locations.
Conclusion: National government-level management and supervision on this issue will be necessary to prevent adolescent access to harmful shops, along with more studies exploring methods for implementation of policies with more systematic control of harmful shops.

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1. Introduction

Environment has a significant influence on growth and development of adolescents, and a negative environment is a particular hindrance to normal personality formation [1]. In addition to temporary effects on adolescence, such negative environments can also have more long-term effects, even into adulthood. In particular, adolescents spend a significant amount of time around school, and they are influenced more around their school environment [2]. Adolescents are immature and therefore are susceptible to the influence of a negative environment, and this situation is being addressed by society. Therefore, they are more likely to be tempted by risky behaviors such as smoking, alcohol drinking, or drug use, due to the environmental influence.

Despite mandatory controls on adolescent smoking and alcohol drinking, they have tended to show a continual increase. According to the 9th Korea Youth Risk Behavior Web-based Survey (2013), the lifetime smoking rate of participants was 21.5%, indicating that they first started smoking when they were in the 1st year of middle school; 43.9% of them had experience of alcohol drinking, and the average age they started alcohol drinking was 14.4 years, which is lower than 15.1 years in 1998 [3]. The reason that the alcohol drinking rate is relatively higher than the smoking rate is due to Korean culture, which is relatively favorable to alcohol drinking, and it is readily available. However, adolescent alcohol drinking is not merely an issue of problem alcohol drinking or alcoholism, it may also create conflicts with parents, friends and teachers, and it increases the chance of secondary harmful effects, such as unexpected violence or sexual behavior [4,5]. Children from single-parent or parentless families show relatively higher delinquency rates, and adolescents from single-parent families are more involved in health risk behavior such as smoking, alcohol drinking, and drug taking [6,7].

South Korea has introduced and implemented a system of "school environment cleanup zones" under the School Health Act in 1967, for more efficient student guidance, better scholastic achievement, and more amicable emotions in students. However, despite this regulation, the number of harmful shops in the school environment cleanup zones in 2013 was reported as 40,531 [2], and recently, as regulations on harmful shops and prostitution have become stronger, many new varieties of harmful shops have tended to appear.

Precedent studies on the noxious environment to juveniles in our country also reported that the detrimental factors of the harmful environment and shop affected juveniles' problem behavior [2], and that the environmental factors they perceived were associated with their deviation, violence, and criminal action [8]. Adolescents contact with harmful shop and their surrounding environment is related to problem behavior [1,9].

In developed countries, as culture and lifestyle are fundamentally different from ours, hiring teenagers to work in entertainment spots for adults, access to those kinds of places, smoking or alcohol drinking do not become social issues. Nevertheless, various systems for protection of adolescents from harmful environments and preservation of the educational environment around schools have been implemented [2]. In Japan, laws have been enacted to protect adolescents and the educational environment from negative influences, by controlling the location of harmful shops within 100−500 m of schools. In the UK, Germany and France, adolescent drug addiction and prostitution have become social problems, and various measures are being implemented. In some foreign countries, adolescent delinquent behavior is affected not only by personal factors, family, or peers, but also by the community environment where they reside, which implies that environmental factors are closely connected with adolescent problems [2,8,10].

Although many studies have reported that harmful environments influence adolescent behavior, most were conducted at a local community rather than national level [8,9]. Few studies have investigated the correlation between the harmful environment around schools and health risk behavior such as smoking and alcohol drinking. This study investigated the accessibility harmful shops to middle and high school students and its effect on smoking and alcohol drinking.

1.1. Adolescent access to harmful shops and smoking and alcohol drinking behavior

Risk factors for smoking and alcohol drinking have variables relevant to individual, family, and school [11], and residential type, broken family structure, and economic problems are factors relevant to family [12,13]. When adolescents spend a lot of time with their parents at home, or when their parents have a positive role in their lives, parents have a major influence on adolescents' behaviors positively. Accordingly, if the parent−child relationship is broken, adolescents are more likely to become violent and display deviant behavior [9,10]. Adolescents from more harmonious families enter harmful shops less often [14]. Family structure has a significant effect on adolescent smoking and alcohol drinking, and children from single-parent families drink more than those from two-parent families or two-family households [7,15].

Adolescents are easily tempted to smoke, drink alcohol, take drugs, and experience sex and violence, and are more likely to act out these behaviors impulsively [16]. Even though their alcohol drinking, smoking, and drug use are legally controlled, they are increasing, and these health risk behaviors may develop into social issues [5]. Satisfaction with school life is

related to the student's desire to stop smoking [17]. Interest in learning, positive attitude towards academic performance, and satisfaction with school life are directly and indirectly associated with drug use and problem behavior [7,18].

Male students enter more bars, soju houses, and video rooms than female students [19]. Male students are more likely to enter computer rooms, followed by amusement arcades and video rooms, while female students are more likely to enter singing rooms (karaoke), followed by a place producing game products and video viewing place [19].

Sex, school year, social ego, and family ego, whether or not their parents live together, school level, satisfaction with school life, and school surroundings have an effect on access to harmful shops. Male rather than female students, high school rather than middle school students, students living with their parents rather than not, and students who are more dissatisfied with their school life took a more positive view of harmful shops and accessed them more often [8,9,14,20–22]. The more harmful shops that there are in residential areas, the more likely students are to enter them [8,20,23]. The harmful environment in physically and socially deprived areas increases the chance for adolescents to come into contact with peers who display delinquent behavior, which in turn increases the likelihood of misbehavior. According to Lewin's Field Theory, environment is an important factor in determining human behavior, and it may influence deviant adolescent behavior such as alcohol drinking and smoking [14,15]. If there are many harmful shops near homes or schools, there is an increased likelihood that adolescents will enter such places. Repeated exposure to harmful shops and the activities that occur therein could have a detrimental effect on adolescents' healthy emotional development.

2. Materials and methods

2.1. Study population

We sampled school students in eight cities and seven provinces in Korea by differentiating them according to urban or rural residence and school grades (middle and high school). High schools were divided into general purpose and vocational schools. Approximately 2%, or 107 schools, were randomly sampled from all middle and high schools. Second-grade students in middle and high schools were randomly selected by using cluster stratified sampling method. Before the survey was conducted, we sent official letters requesting cooperation to the city and provincial educational governments of the schools for conduct of two rounds of pre-tests. Then, for 2 weeks, from July 3 to July 19, 2013, the main survey examination was conducted using a self-administered questionnaire online via the homepage of the Ministry of Education student Health Information Center; 1888 and 1563 sets of questionnaires were used for middle school and high school students, respectively, for a total of 3451 questionnaire sets in the final analysis. The ethical considerations of this study were approved by the Sahmyook University Institutional Review Board (IRB), and an IRB number was issued for the study (IRB No. SYUIRB2013-069).

2.2. Harmful shops

We surveyed experience of prohibited acts and access to 24 types of facilities involved in entertainment that may arouse or foster antisocial and unethical behaviors, such as juvenile sexual curiosity, violence, delinquency, and crime, among the prohibited acts and facilities in the clean-up zone, regulated under Article 6 of the School Health Act and Article 6 of the same law's enforcement ordinances.

Regarding harmful shop access, we used principle component analysis and a varimax rotation method to verify the validity (Table 1). We classified each component on the basis of >0.4 factor loading through orthogonal rotation. According to this criterion, we selected four factors and named such as: (1) game place, (2) sex and entertainment place, (3) lodging place, and (4) sex industry place. As a result of the factorial analysis, the explanatory variation of the model was 44.9%, and for each component, gaming establishment was 13.16%, sex and entertainment place 8.24%, lodgment 9.42%, and sex industry place 14.16%. Gaming establishment included games rooms, computer rooms, singing rooms, computer game consoles, billiard halls and multi-rooms; sex and entertainment places included video rooms, video mini-theaters, comic book rooms and dance halls; lodging places included hotels, tourist hotels, and motels; and sex industry places included sex shops, hostess bars, adult goods shops, karaoke bars, telephone/video sex rooms, and adult-only theaters.

2.3. Smoking and alcohol drinking

A smoker was defined as a person who smoked more than one cigarette on more than 1 day for the past 30 days. An alcohol drinker was defined as a person who consumed more than one drink containing alcohol in the past 30 days.

2.4. Statistical analyses

The data were analyzed using SPSS version 21.0. First, the data analysis used frequencies and proportions to describe the characteristics of the study sample. Second, hierarchical logistic regression was used to analyze factors affecting smoking and alcohol drinking. As the sociodemographic variables, we selected sex (reference group: female), level of school (reference group: middle school), and satisfaction with school life (reference group: satisfied). As the environmental variables, we selected residential type (reference group: living with their parents), location of school, and

location of home (reference group: residential area). and the access experience to harmful shops by type (reference group: never been to harmful shops).

3. Results

3.1. Characteristics of the participants

Male students accounted for 51.6% and female students for 48.4%, middle school students for 54.7% and high school students for 45.3%. In middle school, male students were in the majority, compared with female students in high school. With regard to satisfaction with school life, the largest number of students answered "satisfied" (35.4%), followed by "so-so" (28.1%), and "very satisfied" (24.1%), indicating that they were generally satisfied with their school life. With regard to residential type, the largest number of students answered "I live with my parents" (85.0%), followed by "I live with a single parent" (7.6%), and "others" 6.4%. Answers that school and home were located in a residential area or park comprised the largest proportions, 58.3% and 76.7%, respectively, and answers that both were located in the adult entertainment district or shopping district accounted for 7.7% and 7.1%, respectively.

With regard to access to harmful shops by type, game places was 81.8%, lodging places was 21.2%, sex and entertainment places was 16.0%, and sex industry places was 6.8%. Male students entered harmful shops significantly more often than female students ($p < 0.001$). The rate of smoking experience for the past year was 8.3% (male students 12.3%, female 4.1%), and the rate of alcohol drinking was 17.0% (male 20.9%, female 12.8%) (Table 2).

3.2. Access to harmful shops by type

Table 3 shows access to different types of harmful shops according to school level. Access to singing rooms accounted for the largest proportion (66.2%), followed by computer rooms (59.9%), facility for game products (36.6%), billiard halls (25.4%), computer game consoles (21.1%), and multi-rooms (13.4%). Female students entered singing rooms, computer game consoles, and multi-rooms more than male students did, while male students entered computer rooms, amusement arcades, and billiard halls more than female students did ($p < 0.001$). With regard to sex-related entertainment places, comic book rooms accounted for 11.2%, followed by video rooms (4.7%), video mini-theaters (3.3%), and dance halls (1.2%). Only the video mini-theaters showed a significant difference between sexes, with greater access by female students ($p < 0.05$). With regard to access to lodging places, tourist hotels accounted for 16.5%, followed by motels (9.1%), and hotels (7.0%), with greater access by male students ($p < 0.001$). With regard to sex industry places, adult-only theaters accounted for 4.7%, followed by telephone sex rooms (2.1%); however, access to other businesses was low. Male students entered adult-only

Table 1. Results of factors analysis on experience of harmful shops

	Game places	Sex and entertainment places	Lodging places	Sex industry related places	Communality
Facility for game products	**0.741**	0.120	0.099	0.036	0.575
Computer rooms	**0.704**	−0.085	0.024	0.040	0.506
Singing rooms	**0.599**	−0.019	0.140	−0.011	0.379
Computer game consoles	**0.573**	0.290	0.007	−0.012	0.413
Billiard halls	**0.551**	0.038	0.099	0.114	0.328
Multi-rooms	**0.484**	0.252	0.116	0.036	0.313
Video rooms	0.120	**0.688**	0.064	0.055	0.494
Video mini-theaters	−0.019	**0.648**	0.121	0.093	0.444
Comic book rooms	0.322	**0.503**	−0.024	0.029	0.358
Dance halls	0.021	**0.434**	0.013	0.259	0.257
Hotels	−0.018	0.051	**0.793**	0.118	0.648
Tourist hotels	0.026	0.067	**0.793**	0.000	0.656
Motels	−0.034	0.076	**0.662**	0.125	0.495
New sex industry shops	0.062	0.062	0.023	**0.773**	0.603
Hostess bars	0.009	0.107	0.004	**0.733**	0.549
Adult goods shops	0.207	0.047	0.041	**0.720**	0.523
Karaoke bars	0.056	0.108	0.084	**0.663**	0.462
Telephone/video sex rooms	0.147	0.135	0.049	**0.537**	0.309
Adult-only theaters	0.190	−0.026	0.098	**0.427**	0.235
Eigenvalue	2.50	1.566	1.790	2.690	
Explanatory variation	13.156	8.242	9.420	14.158	
Accumulative variation	13.156	21.398	30.819	44.977	

theaters and karaoke bars significantly more than female students did ($p < 0.05$) (Table 4).

3.3. Variables affecting smoking and alcohol drinking

Sociodemographic variable explains 11% of smoking ($\chi^2 = 1810.44$, Nagelkerke $R^2 = 0.11$) in Model 1. In Model 1 regression analysis using sociodemographic characteristics as the only independent variable, sex, school level, satisfaction with school life 1, satisfaction with school life 2 had significant effects. In Model 2, the environmental variables were added to the regression model and the final explanation increased by 0.13 ($\chi^2 = 1772.35$, Nagelkerke $R^2 = 0.13$). The sociodemographic variables were still significant. With regard to the environmental factors, except for school location, residential type 1 (Exp(β) = 1.959), residential type 2 (Exp(β) = 1.897), and home location (Exp(β) = 2.990) were significant. Model 3, in which we input access to harmful shops by type explained 17% of smoking ($\chi^2 = 1712.73$, Nagelkerke $R^2 = 0.17$), and both sociodemographic and environmental variables were found to be significant. With regard to access to harmful shops by type, only the sex industry related places (Exp(β) = 3.582) was verified as a significant variable. The possibility of smoking was higher in male than in female students, in high school than middle school students, in students who were not satisfied with their school life than in the opposite case, when they lived with a single parent, when their school or home was located in the adult entertainment district, and when they more often entered sex industry related places.

Sociodemographic variables explained 10% of drinking ($\chi^2 = 2924.30$, Nagelkerke $R^2 = 0.10$) in Model 1, and sex (Exp(β) = 2.229), school level (Exp(β) = 2.981), satisfaction with school life 1 (Exp(β) = 1.30), and satisfaction with school life 2 (Exp(β) = 2.025) were identified as significant variables. In Model 2, environmental variables explained 12% of drinking ($\chi^2 = 2882.27$, Nagelkerke $R^2 = 0.12$), and sociodemographic and environmental variables were both found to be significant. In Model 3, access to harmful shops by type was added to the regression model and the final calculation increased by 0.16 ($\chi^2 = 2803.90$, Nagelkerke $R^2 = 0.16$). All sociodemographic variables were still significant, however, among the environmental variables, residential type 1 (living with a single parent) and home location were found not to be significant, and residential type 2 (living apart from family or in lodging) (Exp(β) = 1.904) and school location (Exp(β) = 2.047) were still significant. With regard to access to harmful shops by type, gaming establishments (Exp(β) = 1.544), sex and entertainment places (Exp(β) = 1.515), lodging places (Exp(β) = 1.596), and sex industry related places (Exp(β) = 1.833) were all identified as significant variables. The possibility of alcohol drinking was higher in male than in female students, in high school than in middle school students, in students who were not satisfied with their school life than in the opposite case, when they lived apart from their family or in lodgings, when their school was located in the adult entertainment district, and when they had experience entering harmful shops.

Table 5 shows the results of analysis of the final model according to sex. The possibility of smoking was higher in high school than in middle school students among male students, and when their satisfaction with school life was so-so or low, when they lived apart from their family or in lodgings, when the school was located in the adult entertainment district, and when they had many experiences of entering a sex industry related place. Female students showed a difference in significant variables from those of male students. The possibility of smoking was higher in high school students, in students who were dissatisfied with their school life, when they lived with a single parent, when their home was located in the adult entertainment district, and when they entered sex and entertainment and sex industry related places. For male students, school location was an important predictor, whereas home location was a more important predictor for female students than school location. With regard to residential type, living apart from their family or lodging was significant for male

Table 2. Experience in harmful shops and health behavior by sex ($n = 3451$)

		Boys ($n = 1782$)	Girls ($n = 1669$)	Total ($n = 3451$)	$\chi^2_{MH}(p)$[a]
Harmful place[b]	Game place	1445 (81.1)	1379 (82.6)	2824 (81.8)	0.69 (0.405)
	Sex-related entertainment place	272 (15.3)	280 (16.8)	552 (16.0)	0.60 (0.812)
	Lodging place	376 (21.1)	354 (21.2)	730 (21.2)	0.06 (0.812)
	Sex industry place	148 (8.3)	88 (5.3)	236 (6.8)	12.48 (0.0)
Health behavior	Monthly smoking	219 (12.3)	68 (4.1)	287 (8.3)	35.16 (0.0)
	Monthly alcohol drinking	372 (20.9)	213 (12.8)	585 (17.0)	57.81 (0.0)

[a]*Mantel–Haenzel's χ2 after controlling for school grade;* [b]*Rate of experience of entering more than one type of shop.*

Table 3. Access to types of harmful shop by sex ($n = 3451$)

Harmful shop type		Middle school ($n = 1888$)		High school ($n = 1563$)			
		Boys ($n = 1090$)	Girls ($n = 798$)	Boys ($n = 692$)	Girls ($n = 871$)	Total ($n = 3451$)	$\chi^2_{MH}(p)$[a]
Game place	Singing room	46.2	79.0	67.8	78.7	66.2	205.2 (0.0)
	Computer room	73	40.9	78.7	46.1	59.9	366.08 (0.0)
	Facility for game products	32.6	35.5	42.7	38.1	36.6	0.03 (0.854)
	Billiard hall	21.2	11.0	55.5	20.9	25.4	205.82 (0.0)
	Computer game console	21.9	25.2	16.6	19.6	21.1	5.05 (0.025)
	Multi room	9.3	18.3	11.0	16.1	13.4	38.01 (0.0)
	Game place experience[b]	79.2	82.3	84.2	82.9	81.8	
		(middle school: 80.5)		(high school: 83.5)			
Sex-related entertainment place	Comic book room	9.5	10.6	14	11.6	11.2	0.13 (0.720)
	Video room	5.0	4.6	5.2	3.8	4.7	1.24 (0.265)
	Video mini-theater	2.4	2.9	2.5	5.4	3.3	5.91 (0.015)
	Dance hall	1.3	1.6	0.9	0.9	1.2	0.15 (0.699)
	Sex -related entertainment place experience[b]	13.8	15.1	17.8	18.4	16	
		(middle school: 14.3)		(high school: 18.1)			
Lodging place	Tourist hotel	16.2	18.2	15.1	16.5	16.5	1.73 (0.189)
	Motel	10.5	6.1	11.9	7.8	9.1	18.53 (0.0)
	Hotel	8.0	7.3	6.6	5.9	7.0	0.50 (0.479)
	Lodging place experience[b]	21.6	22.7	20.3	19.8	21.2	
		(middle school: 22.1)		(high school: 20.0)			
Sex industry related place	Adult only theater	5.1	3.7	7.8	2.8	4.7	16.27 (0.0)
	Telephone sex room	2.9	2.7	2.2	0.6	2.1	2.45 (0.117)
	Karaoke bar	0.9	0.6	2.8	1.1	1.2	5.43 (0.02)
	Hostess bar	0.7	0.9	1.5	0.4	0.8	1.44 (0.23)
	Adult goods shop	0.4	1.6	0.7	0.5	0.8	2.24 (0.135)
	New sex industry shop	0.5	0.5	0.6	0.2	0.5	0.31 (0.579)
	Sex industry related place experience[b]	6.7	6.7	10.9	3.9	6.8	
		(middle school: 6.7)		(high school: 7.0)			

[a]*Mantel–Haenzel's $\chi 2$ after controlling for school grade;* [b]*Rate of having experience in entering more than one shop.*

Table 4. Results of smoking and alcohol as hierarchical linear regression ($n = 3451$)

		Smoking			Alcohol Drinking		
		Model 1 Exp(β)	Model 2 Exp(β)	Model 3 Exp(β)	Model 1 Exp(β)	Model 2 Exp(β)	Model 3 Exp(β)
Sociodemographic variables	Constants	0.018	0.015	0.011	0.061	0.055	0.030
	Sex	4.031***	3.911***	3.704***	2.229***	2.139***	2.126***
	School level	2.239***	2.206***	2.163***	2.981***	3.023***	3.058***
	Satisfaction with school life 1	1.788***	1.747***	1.772***	1.300*	1.278*	1.301*
	Satisfaction with school life 2	2.626***	2.403***	2.268***	2.025***	1.926***	1.908***
Environmental Variables	Residential type 1		1.959**	1.835**		1.406*	1.328
	Residential type 2		1.897**	1.787**		2.035***	1.904***
	School location		1.655	1.865*		1.932**	2.047**
	House location		2.990***	2.370**		2.071**	1.643
Experience of harmful place by type	Gaming establishment			1.207			1.544**
	Sex and entertainment place			1.270			1.515**
	Lodging place			1.168			1.596***
	Sex industry related place			3.582***			1.833***
df		4	8	12	4	8	12
−2 Log likelihood		1810.44	1772.35	1712.73	2924.30	2882.27	2803.90
Nagelkerke R^2		0.11	0.13	0.17	0.10	0.12	0.16

Sex (ref: female), school level (ref: middle school), satisfaction with school life (ref: satisfied); residential type (ref: living with parents), location of school and location of home (ref: residential area); experience of harmful shop by type (ref: never). *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. df = degrees of freedom.

Table 5. Results for smoking and alcohol according to sex as hierarchical linear regression

		Smoking		Alcohol drinking	
		Boys	Girls	Boys	Girls
		Exp(β)	Exp(β)	Exp(β)	Exp(β)
Sociodemographic factors	Constants	0.045	0.007	0.065	0.029
	School level	2.032***	2.551**	3.478***	2.422***
	Satisfaction with school life 1 (so so)	1.842**	1.715	1.282	1.359
	Satisfaction with school life 2 (not satisfied)	2.405***	2.232*	2.145***	1.771**
Environmental factors	Residential type 1 living with a single parent	1.387	2.845**	0.999	1.757*
	Residential type 2 living alone	1.872**	1.521	1.940**	1.867*
	School location	2.245**	0.740	2.851***	0.514
	House location	2.007	4.387**	1.015	4.298**
Experience of harmful shop by types	Gaming establishment	1.146	1.381	1.386	1.783*
	Sex-related entertainment place	1.015	2.035*	1.381*	1.725**
	Lodging place	1.190	1.144	1.623**	1.575**
	Sex-related place	4.126***	3.390**	1.963**	1.840*
n		1782	1669	1782	1669
		Y = 1563	Y = 1601	Y = 1410	Y = 1456
		n = 219	*n* = 68	*n* = 372	*n* = 213
df		11	11	11	11
−2 Log likelihood		1190.15	510.50	1614.34	1169.00
Nagelkerke R^2		0.14	0.12	0.18	0.12

Sex (ref: female), school level (ref: middle school), satisfaction with school life (ref: satisfied); residential type (ref: living with parents), location of school and location of home (ref: residential area); experience of harmful shop by type (ref: never). *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. df = degrees of freedom.

students, while living with a single parent was found to be significant for female students, indicating that female students were more influenced by family environment.

The possibility of alcohol drinking was higher in high school than in middle school students among male students, and when their satisfaction with school life was low, when they lived apart from their family or in lodgings, when the school was located in the adult entertainment district, and when they had many experiences of entering sex and entertainment places, lodging places, and sex industry related places. Female students showed a difference in the significant variables from those of male students. The possibility of drinking was higher in high school students, in students who were dissatisfied with their school life, when they lived with a single parent, when they lived apart from their family or in lodgings, when their home was located in the adult entertainment district, and when they entered all four types of harmful shops. For male students, like smoking, school location was a significant variable, while home location was a more important predictor of alcohol drinking behavior for female students than school location. With regard to residential type, it was a significant predictor of smoking and alcohol drinking behaviors. Female students are more influenced by family environment and home location.

4. Discussion

Adolescents are more likely to be involved in health risk behaviors or delinquency, such as smoking, alcohol drinking, or drug use, when they are exposed to certain surroundings, especially harmful shops. Many studies have reported on adolescents' smoking and alcohol drinking, however, few studies have investigated how frequently adolescents enter harmful shops and on how much this affects their smoking and alcohol drinking. Few of these studies were conducted on a nationwide scale, and only presented results from particular regions, so that they were not sufficiently representative. The present study investigated middle and high school students' access to harmful shops and how this affected smoking and alcohol drinking.

4.1. Adolescents' smoking, alcohol drinking and access to harmful shops

In the present study, the smoking rate was 8.3% (male students 12.3%, female students 4.1%) and monthly alcohol drinking rate was 17.0% (male students 20.9%, female students 12.8%). Although the Juvenile Protection Act prohibits selling cigarettes and alcohol to young people under the age of 19 years,

many teenagers were reported to smoke and drink. According to the 9th Korea Youth Risk Behavior Web-based Survey conducted by the Korea Centers for Disease Control & Prevention in 2013 [3], the current smoking rate was 9.7% (males 14.4%, females 4.6%) and the current alcohol drinking rate was 16.3% (males 19.4%, females 12. 6%), which are not greatly different from the present results, indicating that our findings are reliable.

We showed that 81.8% of juveniles had entered a gaming establishment. Other studies [9,14] have reported similar results, showing that the places most accessed by students were singing rooms, computer rooms, and amusement arcades. In addition, their degree of awareness of the dangers of these places was low and they had a positive attitude toward them. Although gaming establishments do not allow adolescents to work there, they are allowed to enter the premises, and they can easily come into contact with any harmful media. In addition, these places can give rise to or facilitate smoking, alcohol drinking, violence, delinquency, or crime, which can be an obstacle to healthy physical and mental development [2]. However, because many adolescents already enter these premises and perceive them as positive, it is necessary to prohibit more thoroughly drinking and smoking in these premises and ensure that they are not exposed to the harmful media, rather than unconditionally controlling access. A significant number of adolescents were known to enter lodging places (21.2%), sex and entertainment places (16.0%), and sex industry related places (6.8%). Despite the fact that sex industry related places such as adult-only theaters and telephone sex rooms do not allow teenagers to enter, we found that they were entering such premises. Therefore, a thorough crackdown is needed to prevent adolescents from entering these places.

4.2. Correlation between access to harmful shops and smoking and alcohol drinking

We found that male students, high school students, students whose satisfaction with school was so-so or who were dissatisfied with school were more likely to smoke, which is similar to other studies [9,14,19].

In Model 2, in which we inputted environmental factors and controlled for individual variables, for smoking, sex, level of school, satisfaction with school life, residential type, and home location were significant, but school location was not. For alcohol drinking, all variables were found to be significant. Living with parents was a very significant predictor to smoking and alcohol drinking behavior. Other studies [7,15] have also shown that adolescents are more likely to smoke, drink alcohol, and commit other deviant behaviors, when they live with a single parent or when they live apart from their family or in lodgings. Family and school are important environmental factors that negatively affect adolescents, and among these, broken family structure is a major risk factor [12].

In Model 3, in which we controlled for individual and environmental variables, these variables were still identified as significant for smoking, and entry to sex-related businesses was the important predictor. Students whose school and home were located in the adult entertainment or shopping districts were found to smoke and drink more than those in a residential area or park, from which we conclude that surroundings do affect juvenile delinquency. Lewin's Field Theory stresses that the surroundings are important in determining human behavior, and interdependence between the individual belonging to the surroundings and the environmental features is especially important [24], which we also identified. As the correlation between alcohol drinking and access to places that are harmful to juveniles is high, regulation of access is needed. Alcohol drinking is more dangerous, because it brings conflicts with parents, friends and teachers, and gives rise to secondary problems such as violence, damage to property, and unplanned sexual behavior, as well as physical and mental effects, such as developmental disorder, suicide, and depression [5,25]. Other studies [8,23,26,27] have also shown that when juveniles have a greater access to harmful shops, it has a more negative effect on their development and can lead to delinquency and deviant behavior.

In the final model, which considered sex, school location was an important predictor for male students' smoking and alcohol drinking, whereas home location was a more important predictor rather than school location for female students. For male students' residential type, living apart from their family or in lodgings was significant, but for female students, living with a single parent was significant, indicating that family structure is an important risk factor for female students. That is, the environment around the school seems to affect male students, while family environment affects female students. Adolescents are influenced by their surroundings and they form their personality and grow physically, mentally, and socially through them. Although adolescents spend most of their time at home and school, the environment that they come in contact with while commuting to school affects them both directly and indirectly.

With regard to smoking, access to sex industry related places affects male students significantly, and sex and entertainment places and sex industry related places affect female students significantly. Female students smoke in closed spaces, such as video rooms, therefore, due to social convention, female students entering sex and entertainment places are more likely to smoke. With regard to alcohol drinking, male students were more likely to drink when they accessed harmful shops, except for gaming establishments. Female students were more likely to drink when they entered all four types of harmful shops. Therefore, access to

harmful shops has a greater influence on female students. Accordingly, development and implementation of prevention programs against smoking and alcohol drinking according to sex are needed.

Although there are laws such as the School Health Act and Juvenile Protection Act that regulate the environment that is harmful to juveniles and their access to harmful premises, the existing harmful shops and new varietal harmful shops are openly in business in the school environment cleanup zones. Therefore, national administration and supervision are required to prevent juveniles' access to harmful shops, especially in residential areas. Besides these legal mechanisms or policies, an educational approach should be devised for students to learn to cope on their own, even when exposed to a harmful environment, by making them aware that access to such an environment can cause serious problems, both physically and mentally.

Finally, the present study had the following limitations. We examined smoking and alcohol drinking according to individual factors, environmental factors, and access to harmful shops, however, besides these factors, sociocultural factors, psychological variables such as self-concept and self-esteem, and institutional factors could also be considered.

Conflicts of interest

All authors have no conflicts of interest to declare.

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